



ASSESSMENT OF PHYSICAL FUNCTIONS IN PATIENTS UNDERGOING CARDIAC SURGERIES USING CHELSEA CRITICAL CARE PHYSICAL FUNCTION TOOL- AN OBSERVATIONAL STUDY

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ABSTRACT

Intensive care unit acquired weakness (ICUAW) is a syndrome encompassing the myopathic, neuropathic, and atrophic changes associated with a critical illness. The deleterious effects of the illness itself can lead to rapid muscle loss, delirium, and chronic organ dysfunction. Early mobilization is considered gold standard care. The possible benefits of early mobilization include minimizing muscle wasting, reducing orthostatic intolerance, maintaining bone health, improving lung function by increasing functional residual capacity, maintaining a joint range of movement, and increased psychological wellbeing. The Chelsea Critical Care Physical Assessment tool (CPAx) is a numerical and pictorial composite of 10 commonly assessed components of physical function graded on a six-point Guttman Scale from complete dependence to independence. 30 Patients were recruited from the cardiac ICU of Vikhe Patil hospital. The sampling method was purposive sampling. Post-op CABG and Valvular replacement surgery patients were included aged over 18 years old with CICU length of stay of over 72 hours. The CPax assessment tool was used to assess the patient on the 1st, 3rd, 6th post-operative day of the CICU. Conventional physical therapy treatment is given from the first day until the day of discharge. The CPax contains ten components which include respiratory function, cough, bed mobility, sitting and standing balance, transfers, stepping, walking, and handgrip strength. On the day of discharge from the cardiac ICU, the CPax was used again to assess the physical function status of the patient. The mean score for POD 1st is 14.23, POD 3rd is 29.07, POD 6th is 40.92, discharge day 43.62. there was a negative correlation between CPax score on day 1 and length of stay (p-value-0.3672) and the correlation coefficient (r) is 0.02613.

Keywords: Chelsea critical care physical function assessment tool, intensive care unit, cardiac surgery.

INTRODUCTION:

Intensive care unit acquired weakness (ICUAW) is a syndrome encompassing the myopathic, neuropathic and atrophic changes associated with critical illness (1). Osler first described ICUAW in 1892 as a 'rapid loss of flesh' associated with sepsis however only in the past 20 years has research into ICUAW gained momentum. Clinically it presents as diffuse global muscle weakness after a period of critical illness in the absence of any further causative aetiology (4). It affects both the respiratory and the peripheral muscles. There is a tendency for proximal muscle groups to be weaker than distal muscles groups in the myopathic patient.

The deleterious effects of the illness itself can lead to rapid muscle loss, delirium and chronic organ dysfunction. Combine that with the necessary medical management; enforced bed rest, mechanical ventilation, psychoactive drugs and neuromuscular blocking agents, and the consequences have the potential to be severe. Insomnia, incontinence, physical disability, muscle weakness, post-traumatic stress disorder (PTSD), depression, unemployment, breakdown of inter-personal relationships, sexual dysfunction is amongst the reported sequelae of critical illness (2)

The subjects in my study are post operative cardiac surgery patients. Surgeries include coronary artery bypass graft(CABG), mitral and tricuspid valve repair or replacement. These patients have undergone a major surgical procedure which requires plenty of rest after the surgery. Previously patients were given weeks of bed rest which decreased their functional mobility, but recently it has been found out that low level of physical activity is highly beneficial to the patients. All of the cardiac surgery included in the study are open heart surgeries which requires a median sternotomy. Post-surgical sternal pain is highly prevalent along with difficulty in coughing. Coughing is a crucial part as it helps remove expectorations that are present as an affect of the general anaesthesia. Early mobilization is considered gold standard care. The possible benefits of early mobilization include minimizing muscle wasting, reducing orthostatic intolerance, maintaining bone health, improving lung function by increasing functional residual capacity, maintaining joint range of movement and increased psychological wellbeing (5) Early mobilization in this patient group starts with very basic in bed activities (6). Due to the severity of ICUAW some patients on awakening will have very little, if any, peripheral or respiratory muscle activity; for these patients, simply the process of moving in bed independently is near impossible. Functional re-education usually begins with facilitated rolling and sitting on the edge of the bed. In some cases, these simple tasks will require assistance of three to four trained physiotherapists and nurses, and even with this level of support patients may only tolerate a

few minutes upright before exhausting. The next stage is often sitting out in a supportive chair and use of tilt tables to tilt the patient into a standing posture. Once able to, standing hoists and walking frames can then be used to work on gait re-education and occupational therapists may start to work on activities of daily living, such as washing and dressing and eating and drinking to facilitate independence. This is very much a functional approach to rehabilitation. In addition to this functional re-education specific exercises are often prescribed; initially passive range-of-movement followed by strength training using bedside exercise programmes (6).

The Chelsea Critical Care Physical Assessment tool (CPAx) The CPAx is a numerical and pictorial composite of 10 commonly assessed components of physical function graded on a six point Guttman Scale from complete dependence to independence i.e. zero to five; these are, respiratory function (ventilator support and oxygen requirements), cough effectiveness, ability to roll in bed, ability to get from lying to sitting on the edge of the bed, sitting balance, sit to stand, standing balance, ability to transfer from the bed to the chair, stepping and grip strength. The score is plotted on a radar chart to give an instant pictorial impression of patients function, and an aggregate score out of 50 is equated in order to track and measure recovery more objectively. The CPAx is a descriptive measure. It was not designed to diagnose ICUAW, or indeed to predict functional outcome; its purpose is to assess the severity of functional deficit at the bedside, to describe where the patients' functional deficits lie and to track progress. The aim of the CPAx was not just to validate a scoring system, but also to then use that scoring system as a vehicle for evaluating the recovery process holistically, by exploring recovery trajectory and patient experience of early rehabilitation and using the CPAx tool in practice.(7)

MATERIAL AND METHODS:

This observational study was done at Vikhe Patil memorial Hospital, Vilad Ghat, Ahmednagar, Maharashtra with a sample size of 30 subjects. Duration was from Sept 2019 to Feb 2020.

Study Design: Observational study

Study Location: Vikhe Patil memorial Hospital cardiac care unit, Vilad Ghat, Ahmednagar ,Maharashtra

Study Duration: Sept 2019 to Feb 2020

Sample size: 30 post op cardiac surgical patients

Sample size calculation: Sample size was chosen according to the patient flow in the cardiac care unit between Sept 2019 to Feb 2020

Subjects and selection method: A purposive sampling of lower age limit of 18 years was done.

Inclusion criteria:

1. Post op CABG and Valvular replacement patients

2. CCU length of stay of over 72 hours
3. Anticipated to survive their hospital stay
4. Aged over 18

Exclusion Criteria:

1. Haemodynamically unstable patients
2. Comatose patients
3. Patients with neurological conditions

PROCEDURE:

After the clearance from the ethical committee, post op cardiac surgical patients were screened using inclusion and exclusion criteria. The Chelsea critical care physical function assessment tool was used to assess the patient on the first day of admission to the cardiac ICU. Conventional physical therapy treatment was given from the first day of admission which includes phase 1 and phase 2 of cardiac rehab. The CPax contains ten components which includes respiratory function, cough, bed mobility, sitting, standing, transfers, stepping, walking and hand grip strength.

At the day of discharge from the cardiac ICU, the CPax was used to assess the physical function status of the patient.

STATISTICAL ANALYSIS

Data was analysed using Excel. Mean and SD was calculated

The correlation between length of stay and final cpax score was calculated using instat graphpad.

RESULT

The number of patients recruited in the study with respect to the inclusion criteria was 35. 2 patients died due to comorbid conditions and 3 patients were transferred to wards. Purposive sampling method was used. The study period was from September 2019 to February 2020.

Table 1 summarizes the baseline characteristics depicting the number of males and females included in the study along with the mean age. Mean age for 19 males was 58.42 ± 14.95 and for 11 females was 57.42 ± 14.9 .

Table no. 1: Baseline characteristics:

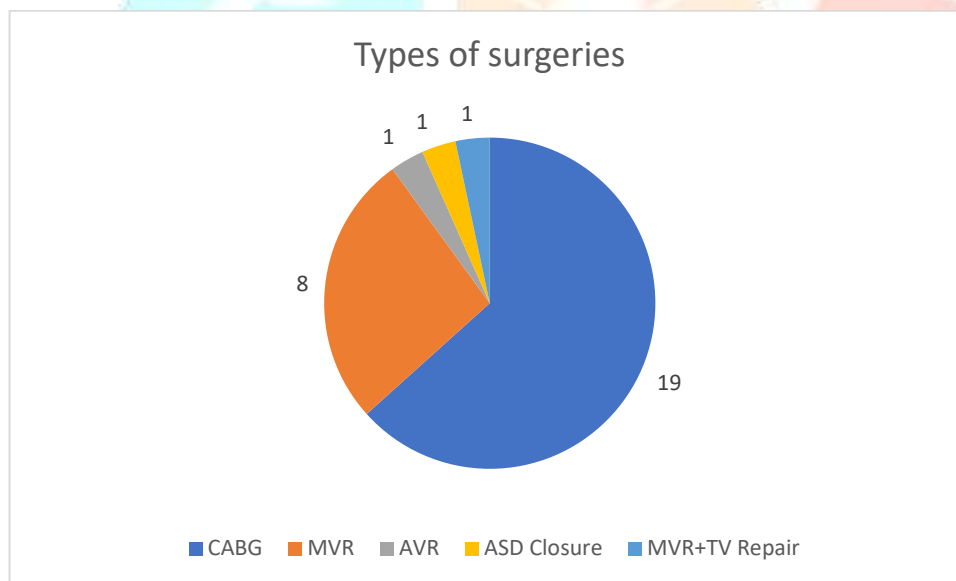
	No. of patients	Age
Males	19	58.42 ± 14.95
Females	11	57.42 ± 14.9
Total	30	58.8 ± 13.15

Table 2 summarizes the types of cardiac surgeries performed in the hospital during the study duration. The most common cardiac surgery performed in the hospital was coronary artery bypass graft (CABG) 63.33%, followed by mitral valve replacement (MVR) 26.66%

In Table no. 2: Types of surgeries

Surgeries	No. of patients
CABG	19
MVR	8
AVR	1
ASD Closure	1
MVR+TV Repair	1
Total	30

Figure no. 1: Pie chart showing the different types of Surgeries



The mean score for POD 1st is 14.23, POD 3rd is 29.07, POD 6th is 40.92, discharge day 43.62.

Figure no. 2: Mean Cpax scores on POD 1, POD 3, POD 6 and Discharge Day

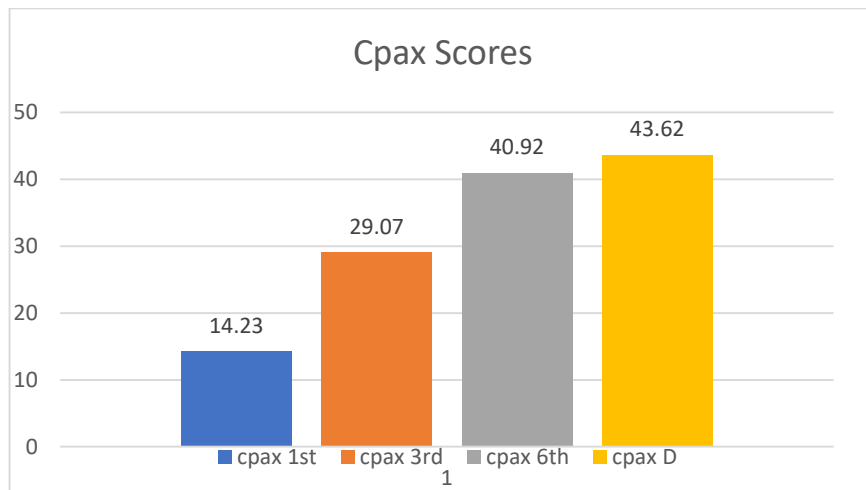


Table 3: Mean Cpax scores of patients after POD 1, POD 3, POD 6 and on various discharge days.

	Discharge Day 6	Discharge Day 7	Discharge Day 8	Discharge Day 9	Discharge Day 10
No. of patients	14	4	10	1	1
Cpax score POD 1	14.42±3.41	16±3.46	13.6±1.50	16	20
Cpax score POD 3	31.71±2.94	32.25±7.13	25.6±5.37	35	32
Cpax score POD 6	45.78±2.25	41.5±3.31	37.6±4.29	43	45
Final Cpax	45.78±2.25	45.5±0.57	43±2.10	49	48

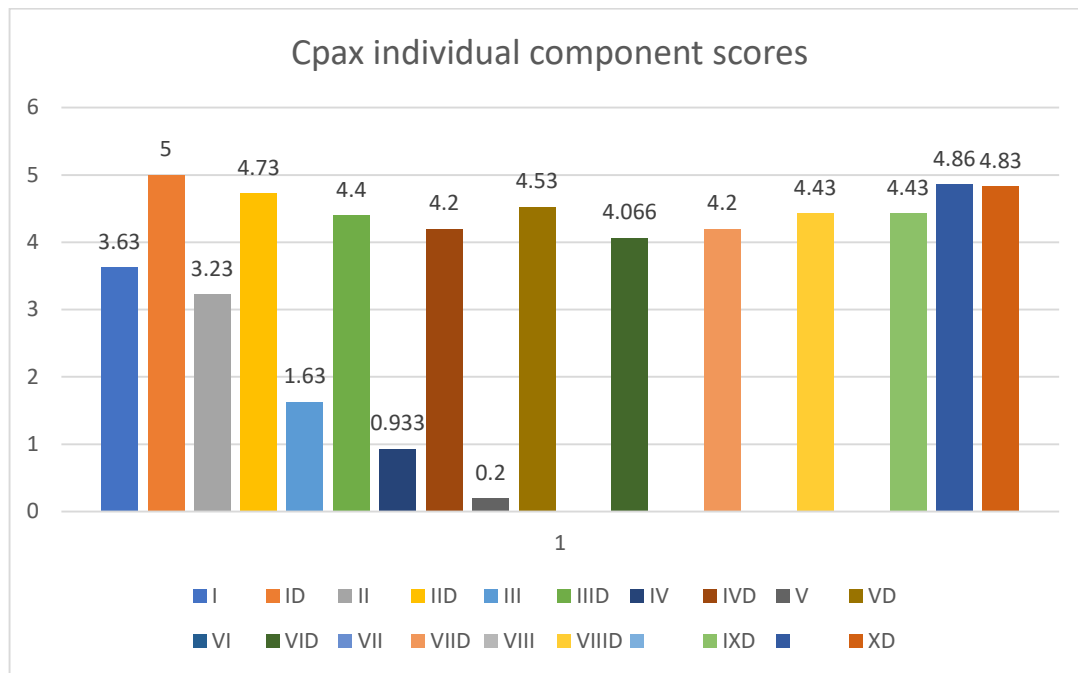
Table no. 3 summarizes the total number of patients who have different discharge days. There are 14 patients got a discharge on Post op day 6, 4 patients got a discharge on post op day 7, 10 patients got a discharge on post op day 8, 1 patient got a discharge on post op day 9 and 1 patient got a discharge on post op day 10.

The Chelsea critical care assessment scale has 10 components. The mean of every individual component was calculated.

Table no. 4: individual components of Cpax assessment tool

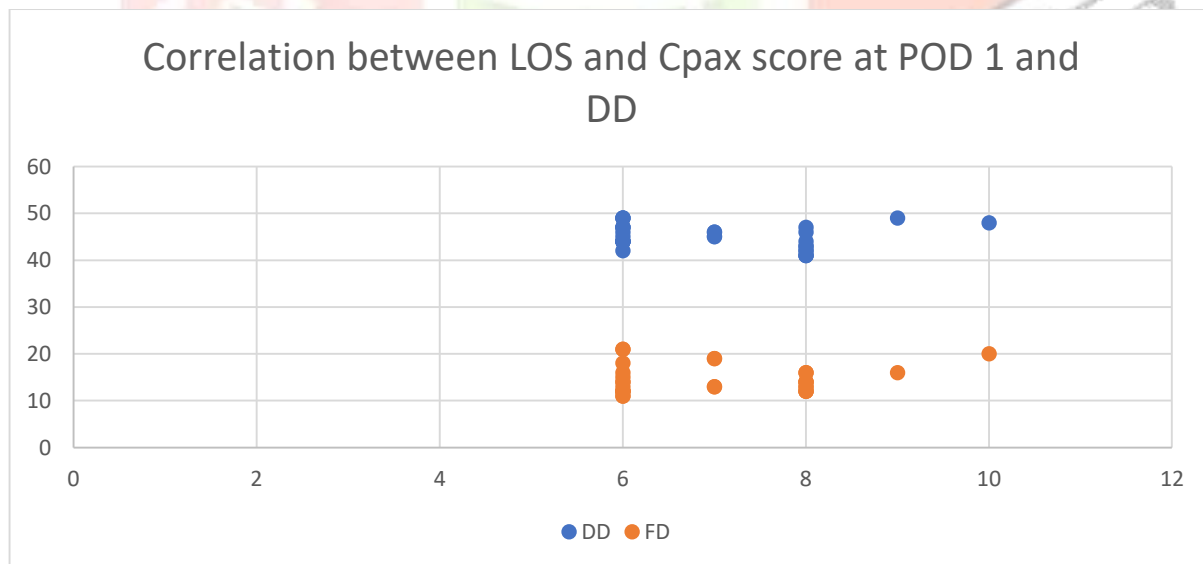
	respiratory function	cough	move in bed	supine to sit	dynamic sitting	standing balance	sit to stand	transfers	stepping	grip strength
POD 1	3.63	3.23	1.63	0.933	0.2	0	0	0	0	4.86
Discharge Day	5	4.73	4.4	4.2	4.53	4.066	4.2	4.43	4.43	4.83

Figure no. 3: Bar graph showing the mean of individual components of POD 1 and discharge day Cpax scores.



Correlation between length of stay and post op day 1 scores and final Cpax scores.

There is a negative correlation between the length of stay and post op day 1 scores and final Cpax scores. The p value is 0.3672 and the correlation coefficient (r) is 0.02613



DISCUSSION:

The aim of the study was to find out the physical function status of patients undergoing cardiac surgeries using the Chelsea critical care physical function assessment tool. The Chelsea critical care physical function assessment tool was developed by Evelyn Corner(6) for efficient assessment in the critical care unit.

During the study duration the patients were given the standard physical therapy according to the cardiac rehab protocol. The physical functions show significant improvement when assessed on surgical post op day 1 and on discharge from the ICU. All the patients included in the study were sent home after their discharge from the ICU and hence the final Cpax scores are extremely relevant as they need to have basic functional mobility to avoid further hospitalization.

There are various scales used for physical function assessment in the critical Care unit which includes SOFA score and the PFIT, but in order to make the assessment more easier Evelyn corner(6) developed a scale in Chelsea hospital in London where all the main components like respiratory function, cough, bed mobility activities, transfers and sit to stand could be assessed using 5 levels- 0 being the worst and 5 being the best. For better visual representation a 10 point guttman scale was used.

In this study, 30 patients who underwent cardiac surgeries were recruited. It was observed that the most common surgery performed was coronary artery bypass surgery (63.33%) .

Changes in physical function are expected to occur during the course of a patient's journey after ICU admission. Improvement in functional ability may be quicker for those who are more awake and alert and respond favourably to the medical, nursing and rehabilitation care provided to them (9)

As their cooperation improves and their condition stabilises, patients are more likely to be able to participate in seated and out-of-bed mobilisation activities during their ICU stay (9)

Corner et al. (2015) (6) reported that a change in CPax score of six or more can be considered a clinically meaningful change in physical function in a burns ICU population.

They also reported that the CPax assisted with patient care and planning, assisted with evaluation of patient progression, served as motivation for patients to participate in treatment, enhanced communication with patients and motivated them regarding patient response to treatment .(8)

Higher CPax scores on ICU admission, but not on ICU discharge, seemed to be associated with shorter hospital LOS. Although some studies have shown that early mobilisation in ICU is associated with shorter duration of ICU and hospital stay (11,9,5), other studies conducted by Clark et al. (12) have found no such associations which is similar to our findings.

Another factor that could have influenced LOS in our study is the relatively short duration of stay of participants in ICU. Participants were younger and less severely ill on admission to ICU compared to demographics reported for other ICU populations and this might account for their shorter LOS (12,9,6). Also the large catchment area for Vikhe Patil hospital and hence the constant demand for ICU beds might have played a role as it is one of the few specialty hospitals in a rural area. Due to this the patients are sent home prematurely(8)

The limitations of the study include the number of participants which is dictated by the patient flow in the cardiac intensive care unit. The grip strength was quantified by the hand grip dynamometer which requires the maximum voluntary contraction. Due to the pain on the post op day 1, it may not always be possible to use the full strength, so the readings might not be accurate.

The clinical implications include efficient assessment in the ICU, goal oriented physical therapy, feedback to the patients regarding their functional status. It also helps the therapist get a better idea of the progress of the patient. Although the literature is scarce on the application of CPax scale, the application of the scale might have an impact on the quality of treatment of the patient. It can be implemented on a large sample size because of the ease and format of the scale.

CONCLUSION

The physical function is significantly improved from post op day 1 to the discharge day when assessed by the Chelsea critical care assessment tool.

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